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THE

# BULLETIN

Vol. VIII.

No. 2

## Hydro-Electric Power Commission of Ontario

### March-April

1921

JUN 9 1921



High Falls. Rapids on Mississippi River

THE  
**BULLETIN**

PUBLISHED MONTHLY BY THE

**Hydro-Electric Power  
Commission of Ontario**

**ADMINISTRATION BUILDING  
190 UNIVERSITY AVE.  
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MARCH-APRIL, 1921

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## \$100,000 Cash is London's Share of Hydro Profits

### Address by Sir Adam Beck at London Rotary Club Luncheon



RE you aware that the people of London, as owners of the local Hydro-Electric power system, the waterworks system, and the London and Port Stanley Railway, and as part owners of the Niagara Power Development and transmission lines have invested \$7,658,524.71 in public utilities?

Or that these great enterprises have produced not only service to be enjoyed by their users, but a profit of \$2,568,148.95 in cash?

Or that the total earnings after paying for operation, maintenance and interest, are \$2,700,000.00, while the plant is worth to-day, less depreciation, \$8,000,000.00 to \$10,000,000.00.

That is, if we sold our interest in public utilities, we would make a net profit on the transaction of at least \$3,000,000.00 and the taxpayers have not contributed one cent to the cost or support of these enterprises.

These somewhat startling facts were brought to the attention of the citizens of London, and particularly to the members of the Rotary Club, in a recent address delivered before that organization by Sir Adam Beck, during which he announced that the Hydro-Electric Power Commission of Ontario, of which he is chairman, is about to hand to the local Public Utilities Commission a cheque for \$100,090.57 as this city's share of the profits of the provincial Hydro system.

The actual figures of London's public utilities as given by Sir Adam are shown in the appended table.

#### HOW HYDRO IS MANAGED

In examining the data relative to the Hydro power enterprise it must be understood that the provincial Hydro-Electric Power Commission sells energy to the municipalities delivered at the city limits. All municipalities served share the cost of the main power generating and distributing system, which is managed on their behalf by the H. E. P. C. Power so delivered is taken over at the city limits and transformed and distributed to the consumers on a system that is owned by the city and administered by the local board of Public Utilities Commissioners.

Thus you will see that London has invested \$1,323,951.45 in the local distributing system, while London's share of the Niagara power system including the Ontario Power and Toronto Power Company plants, represents an additional \$3,123,000.00.

The local system during the ten years since its establishment, has earned actual profits of \$730,808.20, notwithstanding the very low rates charged for light and power service. Of this amount \$160,957.77 has been set aside to pay off debenture debt. An additional \$452,051.45 has been utilized to pay for extensions to the plant, thus avoiding the issuance of extra debentures, leaving \$117,798.98 surplus.

Meanwhile an additional \$281,726.31 of surplus earnings is placed to London's credit by the Hydro-Electric Power Commission, from the profits on operation of the general

Niagara system. London's share is made up of \$51,634.79 paid off the debenture debt, set aside to cover depreciation on London's portion of the system, and a cash surplus of \$100,090.57.

## LONDON'S PUBLIC UTILITIES

	Waterworks	London and Port Stanley Railway System.	London Hydro-Electric System.	London's share of Niagara System including O. P. Co. and Toronto Power Co.	Total of all Public Utilities.
Total Investment in Plant.....	\$1,890,747.76	\$1,320,825.50	\$1,323,951.45	\$3,123,000.00	\$7,658,524.71
Surplus Earnings reinvested in Plant .....	\$ 278,168.82	\$ 189,825.50	\$ 452,051.45		\$ 920,045.77
Accumulated Sinking Funds and Installments on Serial Debentures .....	505,908.10	88,668.51	160,957.77	51,634.79 (Surplus \$100,090.57 Depreciation \$143,617.88)	807,169.17
Surplus Earnings after deducting Operation, Maintenance, Interest and Sinking Fund and Revenue Reinvested in Plant .....	479,426.58		117,798.98	243,708.45	840,934.01
Total Surplus Earnings .....	\$1,263,503.50	\$ 2,8,94.01	\$ 730,808.20	\$ 295,343.24	\$2,568,148.95

### TOOK NO CHANCES

Sir Adam explained in his address that this cash surplus accumulated on the provincial system notwithstanding the fact that rates were cut from time to time in an effort to give service at as low a cost as possible. The surpluses were held by the H. E. P. C. during the first ten years however, in accordance with a policy to be absolutely safe, interest meanwhile being paid by the H. E. P. C. to the municipalities. The Niagara power system was after all, a new venture. Power had never been distributed before for such long distances or at such high voltages and many dire things had been predicted. Now, however, after ten years' successful operation, the Hydro-Electric Power Commission

feels that such surpluses need no longer be held as a special contingency fund, and the profits are to be at once distributed with interest, London's share, as explained being \$100,090.57.

Sir Adam showed that London users of Hydro pay all charges of every kind in their power bills, including \$14,500 of annual taxes, \$6,500 of this amount representing a water rental paid to the Provincial Government for the use this city gets of Niagara Falls.

### LONDON'S HYDRO INVESTMENT

London thus has a total investment of \$4,446,951.45 in her Hydro power services, of this amount \$896,000 was financed by the Provincial Government and a further \$581,000 is guaranteed by the province.

Sir Adam produced a progress report on the Queenston-Chippawa power development at Niagara Falls showing that that gigantic undertaking will be ready for service by the first of September, when two generators, each having a capacity of 55,000 horsepower, will be delivering energy for the people of London and other municipalities in the Niagara zone.

This colossal undertaking, with its 12-mile power canal, which has previously been described, involves the excavation of a greater amount of stone and earth than was dug in building the Panama Canal. The whole undertaking both in its engineering phases, construction and power output is the greatest of the kind in the world. The work is now on schedule time and the H. E. P. C. is able to announce that the cost, as estimated a year ago, will not exceed \$55,000,000.

The Queenston-Chippawa scheme has been carried out under pressure and under exceedingly disadvantageous circumstances. Wages increased 148 per cent., material and equipment 150 per cent., and cement 125 per cent. The latter item was especially serious Sir Adam showed, in view of the fact that hundreds of thousands of barrels of cement were required. The strike, which delayed the work one month and 20 days cost \$700,000, he said, while for a prolonged period he claimed that workers were delivering less than 60 per cent. efficiency.

#### WONDERFUL EFFICIENCY

The Commission in executing this great task, has devised and utilized the most modern and most highly

efficient equipment the world has known, and no opportunity to curtail the cost by commercializing the by-products has been lost. For instance the Commission in digging the canal was compelled to cut a channel involving the removal of millions of cubic yards of rock. A million cubic yards of the best quality for road building or railway ballast have been crushed and held available for the good of the province, while another million or two are stored for convenient utilization when required. The rock is better than that produced in the Dundas quarries, Sir Adam said.

Next year, with Chippawa completed the Hydro-Electric Power Commission will have a total investment of \$210,000,000 in plants established or acquired during the ten year period since London and eleven other cities and towns embarked on the cheap power enterprise. The Niagara System is of course, the principal unit but the Commission now operates fourteen systems in various parts of the province from Port Arthur to Ottawa and back to Windsor. When the Chippawa and Ranney's Falls power developments are in service, the Commission will have, in these fourteen systems, 23 hydro-electric plants with a total capacity of a million horsepower, serving every one of the 22 cities in the province except Sault Ste. Marie. All told the H. E. P. C. scheme now embraces 264 municipalities, including 21 cities, 73 towns, 87 villages, 43 police villages and 40 townships, and in addition, power is now available for consumption in 80 townships.

#### THE ULTIMATE OUTPUT

The ultimate amount of electricity available for practical purposes when the Ottawa and St. Lawrence water-

powers are harnessed will be two and a half million horsepower.

To-day, said Sir Adam, less than 45,000 horsepower of energy used for industrial purposes in this province is produced in private steam plants.

The municipalities in the Hydro-Electric Power System have purchased by friendly negotiation, without arbitration or condemnation proceedings, ninety private power generating and distributing systems, 56 of that number being assumed by the municipalities and 34 by the H. E. P. C.

The marvellous financial solidarity of the people's power enterprises was proven by records placed before the Rotarians by Sir Adam. He showed that the Hydro-Electric Power Commission and the associated municipalities to-day have built up the astounding total of \$17,574,000 in sinking funds, renewal fund, contingency account and surplus reserves in the Niagara system alone.

#### SOUND FINANCIALLY

"This system has now been firmly established," said Sir Adam, "and it will never cost the taxpayer a cent or involve the credit of the municipalities to the extent of one dollar.

"We are able to supply electricity at a price that makes its use possible in the humblest home, not alone for lighting, but to relieve the burdens of the housewife. Manager Buchanan tells me that in London the Hydro Shop is placing electric washers in 25 homes every week; the people are enjoying the use of vacuum sweepers, electric irons, and electric stoves at a cost for power that everyone can afford. Electricity, too, will be a great factor on the farms, notwithstanding

standing the dire predictions that have been made.

"In addressing the Legislature recently I was surprised to learn how little appears to be known of the Hydro power system, who owns it, the principles under which it has been established and operated, or the meagre chance of politics ever entering into it with the safeguards which have been provided.

"We hope that the increased rate of consumption will continue so that the people may enjoy the increased blessings of cheap electricity, and that will happen unless our good friends in the Ontario Legislature tax us out of business altogether."

#### TREMENDOUS SAVINGS

Sir Adam produced figures showing the great financial saving to the users of electricity in Ontario. He declared that electricity is now selling in the Niagara zone at one-third the cost of electricity generated by steam with imported coal.

If the rates charged for electricity in London before the advent of Hydro had been in effect in the past ten years power users of this city alone would have paid \$5,000,000 more for their service than they were actually charged. The citizens of London are now saving more than a million dollars a year, even basing the computation on an exceedingly low estimate of the difference between the rates for Hydro now prevailing and the prices which would be paid to a privately owned steam plant. For instance London domestic consumers were charged nine cents per unit, plus a meter rental, before the coming of Hydro. To-day the average rate for

domestic consumers in London is only  $2\frac{1}{4}$  cents net. Meanwhile a private company is charging 6 cents for water generated electricity in Montreal, and the average rate prevailing in the United States is 8 cents. Even at so low a rate London's system flourishes.

"The whole liability of the City of London could be paid off out of your profits in ten years if present rates were maintained," said Sir Adam.

#### A SANE SYSTEM

Apart from the system of the Dominion Power and Transmission Company of Hamilton the people of Ontario through the Hydro-Electric Power Commission now have an absolute monopoly in the power business in their own behalf. The Provincial Government is given full control over the Commission's operations as every move for extensions, purchases or rate adjustments must be ratified by the lieutenant governor in council. The government, for any guarantees it has provided in Hydro financing is given a lien on all of the properties of the H. E. P. C. and behind that stands the credit of the municipalities. All charges are met out of power rates which cover not only operating expenses, but all capital charges, contingency funds, taxes and a depreciation reserve that would enable the Commission to scrap the whole plant and replace it with a new one at the end of thirty years, without issuing new debentures.

Meanwhile the whole property is kept up in perfect condition. The H. E. P. C. has its inspectors not only for its own transmission system, but they insist that no deterioration of the plant be allowed in the municipi-

palities. To-day Hydro ranks as one of the greatest assets of the people. Predictions that this public ownership enterprise would affect vested rights and stop the flow of money for investment from England and the United States has been disproved.

The Commission readjusts rates to the municipalities annually on a basis of actual cost with a safe margin for contingencies. Between 500 and 600 auditors are constantly probing and delving in this huge task of adjusting charges.

#### POWER FOR FARMS

Sir Adam turned to the proposal of a committee of the legislature to impose an annual tax of \$2 per horsepower on Hydro to provide a fund to bonus construction of rural lines and thus cheapen the cost of power to farm consumers.

The direct tax would cost London users of Hydro approximately \$22,000 a year and as the city's consumption of energy increases the tax of course, would advance in proportion.

Sir Adam showed that the H. E. P. C. has certain binding agreements to sell large blocks of power at fixed rates for a period of years. As a result the tax on such power could not be collected and it would have to be borne by the municipalities in addition to their own share, because, he asserted, the Hydro municipalities will never be accused of breaking the law of the land or treating their agreements as scraps of paper.

"Happily," said Sir Adam, "the committee reported that it is opposed to the establishment of a flat rate for Hydro power. That would destroy

the whole Hydro system. The taxpayers and the province cannot lose on this enterprise under the conditions that have heretofore existed. The safeguards are absolute. If there should be a deficit in any city or town we can increase the rates to cover the cost; on the other hand when we have surpluses we mail the cheques to the municipalities and all are treated fairly and alike. Notwithstanding a hundred per cent. increase in all costs during the war we have never had a rate increase yet.

#### A SERIOUS MISAPPREHENSION

"The committee that recommended the \$2 tax was under a misapprehension. The Labor member for St. Catharines who was a member of the committee, says he never heard of the alternative proposal to give the farmers cheap power by using part of the \$327,000 now derived by the province from water rentals. I told two members of the committee in my office in Toronto. I have suggested that method publicly many times in the past six years and if the committee members had come to the H. E. P. C. all information would have been available to them. They ask that the blessings of cheap power be extended to all the people. If there ever was an asset or resource of the country available to all the people of the country, Hydro is it. We are now serving forty townships and we have power available to those who want it in eighty. We are giving service even to the smallest hamlets, such as Washington, which takes a load of only ten horsepower.

"They recommend that those who established the Hydro system should be penalized to raise a \$2,000,000 fund

to build rural lines. That tax, though benefitting the farmers only to the extent of \$2,000,000, means a loss of \$5,000,000 to the Hydro municipalities. In buying the Ontario Power Company out at Niagara Falls we were compelled to take over a long term contract to sell \$60,000 horsepower at a fixed price. The contract was originally framed to continue until the year 2010 A.D., but we succeeded in having it cut down to 1950 A.D. On another contract we would lose \$58,000 a year. The vested rights of the municipalities should be as sacred to the legislature as the vested rights of private corporations.

#### HYDRO WORLD FAMOUS

"This Hydro scheme is being watched by every country on the face of the earth. The results of this enterprise have penetrated to Holland, to Norway, to South Africa, and to Australia; the Japs know what has been done as well as you do. Nothing should be done to wreck this work of the people now. It is the property of the municipalities. I am a heavy taxpayer here in London. You and I are partners in this great work.

"No country on the face of the globe has done so much to bring electricity to the farmers in so great a quantity and at so low a cost. During the war we were prevented by legislation from continuing expansion in the rural districts but that was no fault of the Hydro-Electric Power Commission or the municipalities."

Sir Adam showed that the committee recommended that the \$2,000,000 proceeds of the \$2 tax be used to pay eighty per cent. of the cost of construction and maintenance of rural lines.

"Give us a quarter of a million dollars and we will build 600 to 700 miles of lines for the farmers every year," he said. "We can show the government how that money can be got from the water rentals without taxing anyone or ruining Hydro."

#### SUCCESS OF THE L. & P. S. R.

"The whole cost of the electrification of the railway will have been paid for out of earnings in another 24 years," said Sir Adam in pointing out that six of the thirty annual payments on the debentures have already been provided for.

"Electrification," he said, "in the first six years of operation, has earned profits totalling \$278,494.01, represented by \$189,825.50 of surplus earnings reinvested in extending and improving the property, and \$88,668.51 paid off the debt. This is profit on the electrification cost only.

The old property as it stood in steam road days shows a better return than ever before. The Pere Marquette during the last year of its tenancy paid the city \$15,827.86 rental and \$1,331.04 in taxes, a total of \$17,158.90. The London Railway Commission has paid a rent of \$20,000 for the old property every year since it was taken over, taxes in 1920 totalled \$3,441.87, a total return to the city treasury on the old investment of \$23,441.87 or an increase of \$6,282.97 over the amount received by the city council for the same property from the Pere Marquette. Beginning in 1924 the rent will increase from \$20,000 to \$25,000 per annum and eventually, under the agreement with the London Railway Commission the rent will amount to \$50,000 a year."

#### A PROSPEROUS UTILITY

Sir Adam stated that notwithstanding the strike last year, which he believed had been rashly called, the railway had the most prosperous year in its history, as will be shown when the annual report is passed by the auditors. "Wages," he said, "have been increased 140 per cent. since electrification, and the advance made last year alone gave the men an extra \$22,900."

The passenger rates (not including summer excursion business) saved those who used the line \$42,217.14 last year as compared with the higher fares on the steam lines. Inclusion of the summer excursion traffic would make an enormous difference. "Freight rates," he said, "are so much lower that on coal alone shippers were saved \$6,092.50 during the year.

"If the London and Port Stanley Railway is administered free from politics it will be second only to Hydro as a revenue producer for the people of London; in fact I believe it may yet take first place," he stated.

#### SIR ADAM'S ADVICE

Concluding his address, Sir Adam declared that "If there is one thing this city needs more than another, it is a competent municipal finance commissioner, to give such service as has been rendered to the city by Mr. Bradshaw in Toronto. It is impossible for a man to come in from year to year and take charge of financial matters with which he is not familiar. Surely you could get an expert who would give part of his time. I am convinced that such a man could save thousands of dollars for the taxpayers of London, as Mr. Bradshaw has done for Toronto."

The following circular letter was forwarded to all the municipalities on the Niagara System:

April 8, 1921.

Dear Sir:

I have been instructed to advise you that arrangements have been made whereby additional power is now available to supply municipalities on the Niagara System until such time as the Queenston-Chippawa Plant is completed, and, as the Commission is anxious that the load on the Niagara System should be built up as much as possible during the present season, in order that there may be a load for the first two units of the Queenston-Chippawa Development when they are put into operation, I would ask your Commission to use every effort to obtain all the business possible during the present season.

Yours very truly,  
W. W. POPE,  
Secretary.

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### Growing Trees on the Prairies

Undoubtedly there are more difficulties met with in raising trees on the prairies than are to be found in the eastern provinces. In the first place the rainfall is very limited. Second, the trees have to withstand a great deal of exposure to storms and extremes of temperature. Third, the prairie soil as we now find it, after years of exposure to the elements, is so compact and hard that it needs to be specially prepared before it is fit for tree-growth. None of these conditions is, however, of such a nature as to make the raising of trees an impossibility, but by following out certain methods which are indicated by results already obtained, tree growing on the prairies can be made just as successful and perhaps, even more certain than wheat raising.—*Bulletin No. 1, Dominion Forestry Branch.*

### Ambulance for Sheep.

A motor ambulance especially designed for the care of sheep, and containing ten pens, five on each side, is an unusual but highly valuable adjunct to an enormous sheep ranch in Alberta. During the past season some 7,000 lambs were born on the ranch and the busy ambulance was the means of saving the lives of hundreds of them.—*Popular Mechanics.*

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### Ambassador's House.

The house of an ambassador is regarded as being part of the country to which the ambassador belongs, and he does not, therefore, have to conform to the law of the state to which he is appointed.—*Toronto Telegram.*

## The Thirteenth Annual Report

By R. C. McCollum

*Auditor of Municipal Accounts, Hydro-Electric Power Commission of Ontario*

The full measure of the success of the Hydro-Electric enterprise in the Province of Ontario is not revealed in the reports or statistics prepared from the records of the Provincial Commission of its operation. There is no way in which the value to the community of cheap light and power, and its effect on the economic life of the people can be computed in terms of dollars and cents, and in its capacity as agent or trustee for the municipalities, purchasing or developing power and transmitting same on a cost basis, assuming no risks of loss, and with no possibility of gain, the success of the Hydro-Electric Power Commission is measured by the increase or decrease in its sphere of service rather than by direct financial gains.

The final answer must be found from an examination of how Hydro contracts, obligations and service have affected the real owners of the enterprise, i.e. the municipalities whose contracts with each other through the Commission hold them responsible for any loss and at the same time absorb all profits of every nature, direct or indirect resulting from Hydro operations.

All of this information appears annually in the blue bound governmental reports issued by the Hydro Commission, but an infinitely small percentage of the people interested in Hydro have

access to these reports, and only a few of these would undertake the task of ascertaining just what the reports show.

The Provincial Commission has no profit or loss. When its books are closed at the end of each fiscal year, and the exact cost of operation determined, down to the last item of adjustment, and after making every necessary and proper provision for depreciation and contingencies of every nature, a final bill or credit memo as the case may be, is sent to every municipality for the difference between the actual cost and the twelve bills already rendered at the estimated cost, and these final bills are taken up in the municipal books as part of the cost of power for the year.

The annual reports prepared for each municipal Hydro system show the result of operation for the year just past, and in the balance sheet a record of the cumulative results to date, and to these reports we must look for the final answer, or conclusive evidence of the success or failure of the undertaking as a whole.

The following statement shows in very condensed form the result of operation in every Hydro municipality during 1920 and so clearly as to render further explanation unnecessary. It also shows the accumulated surplus or deficit to December 31, 1920, and this does not take into ac-

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count the reserves which have been created to provide for future renewals or depreciation nor the payments which have been made toward retirement of the debenture debt.

The most outstanding feature of this report is the phenomenal success of the Niagara System. Out of a total of 125 municipalities in this system, there were but 12 in which the revenue was insufficient to meet all direct charges and provide full depreciation, and the 3 municipalities in which an actual money loss occurred were all township systems where normal extensions for new business have been held up on account of lack of power and for other reasons.

The operation of the smaller systems is not quite so gratifying but the trouble in nearly every case is due to slower recovery from wartime conditions and the inability of the municipalities to take the full load for which generating and station equipment had been provided. In almost every case the necessary additional load has been arranged for and each system will in time show every municipality operating with a profit.

The balance sheets of all the Hydro municipalities have also been consolidated into one report, precisely as though they were each a subsidiary of a great enterprise, and these reports are shown comparatively for each year 1913 to 1920 inclusive. During this period the number of municipalities has increased from 45 to 195 and the total assets have grown to nearly thirty-five million dollars, against which there are outstanding liabilities of less than twenty million dollars, and the percentage of net

debt to total assets has already dropped from 88% in 1913 to 65.3%.

One of the most interesting features of the report is the large amount of cash and securities held by the local Hydro systems, the total now approximating one and one-quarter million dollars, a condition unique in municipal enterprises. The negotiable quick assets such as cash, securities, accounts receivable and inventories now amount to considerably over four million dollars or over twenty per cent. of the total liabilities, and the general financial condition cannot help but be a matter of considerable gratification and pride to every municipality operating under a Hydro contract as well as to every individual who has had any part in the inception of the huge enterprise and in its development to the present time.

*(See Tables on following Pages)*

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### Electricity in Queensland

Queensland has undertaken the production and distribution of electricity on an extensive scale for irrigation by means of wells and pumps installed in scores of land holdings.

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### New York's Nickname

Gotham was given to the City of New York as a name as a matter of jest and derision by Washington Irving, William Irving and James K. Paulding in their humorous weekly that satirized the people of the metropolis in that period because of their assumption of great wisdom.

**REPORT SHOWING OPERATION OF ALL HYDRO  
NIAGARA**

Municipality	Power Purchased	Operation and Maintenance	Debenture Charges and Interest	Total Operation	Revenues
Acton.....	\$ 5,089 11	\$ 4,105 73	\$ 462 96	\$ 9,657 80	\$ 12,321 06
Ailsa Craig.....	5,223 55	360 65	432 25	6,016 45	8,188 57
Ancaster Twp.....	2,357 59	1,795 09	1,616 85	5,769 53	7,699 96
Aylmer.....	6,914 46	3,610 19	3,923 74	14,448 39	18,507 75
Ayr.....	2,979 68	683 98	1,119 31	4,782 97	6,684 43
Baden.....	5,356 87	557 33	153 51	6,067 71	7,723 21
Beachville.....	7,754 08	628 61	.....	8,382 69	10,351 82
Blenheim.....	5,813 80	2,203 87	1,116 18	9,133 85	12,273 69
Boton.....	5,049 19	852 72	1,301 84	7,203 75	8,826 72
Bothwell.....	6,143 05	479 10	1,320 51	7,942 66	10,809 02
Brampton.....	20,818 69	5,818 72	3,577 07	30,214 48	33,683 35
Brantford.....	74,367 64	38,526 13	19,782 38	132,676 15	149,320 10
Brantford Twp.....	4,170 64	4,083 03	4,249 19	12,502 86	13,306 21
Brigden.....	4,176 59	671 01	921 95	5,769 55	8,159 48
Burford.....	2,400 95	645 13	505 52	3,551 60	4,249 56
Burgessville.....	1,117 11	169 87	278 27	1,565 25	1,790 84
Caledonia.....	1,596 05	657 29	350 22	2,603 56	3,909 79
Chatham.....	67,557 26	31,355 94	17,120 10	116,033 30	147,290 31
Clinton.....	7,271 67	2,350 93	3,000 53	12,623 13	15,213 70
Comber.....	4,770 69	586 40	653 55	6,010 64	7,765 26
Chippawa.....	760 70	1,049 26	755 57	2,565 53	3,500 48
Dashwood.....	2,456 59	293 60	224 06	2,974 25	3,249 65
Delaware.....	603 70	73 56	208 75	886 01	1,247 29
Dereham Twp.....	2,011 61	1,461 06	3,397 34	6,870 01	6,749 17
Dorchester.....	1,005 45	362 40	253 62	1,621 47	2,511 65
Drayton.....	3,108 98	238 73	667 08	4,014 79	4,867 60
Dresden.....	6,266 51	1,698 74	1,396 48	9,361 73	14,586 32
Drumbo.....	826 50	259 90	293 96	1,370 36	1,989 30
Dublin.....	1,341 17	259 68	519 46	2,120 31	2,612 36
Dundas.....	18,712 98	11,793 70	3,787 70	34,294 38	40,928 55
Dunnville.....	10,142 98	3,357 86	5,141 02	18,641 86	19,763 93
Dutton.....	3,454 09	1,192 05	506 58	5,152 72	6,855 55
Elmira.....	7,534 73	2,809 64	1,447 96	11,792 33	15,884 87
Elora.....	6,748 21	2,600 11	1,027 00	10,375 32	13,130 00
Embro.....	3,064 83	385 93	736 97	4,187 73	4,831 91
Etobicoke Twp.....	5,880 85	4,921 80	7,165 83	17,968 48	28,159 02
Exeter.....	6,118 90	2,431 44	1,202 29	9,752 63	13,400 66
Fergus.....	6,056 91	2,787 12	1,367 14	10,211 17	10,968 17
Forest.....	5,968 41	2,510 48	2,811 10	11,289 99	14,396 52
Galt.....	56,601 99	21,851 58	15,583 60	94,037 17	123,370 33
Georgetown.....	16,197 02	4,235 13	1,422 62	21,854 41	30,410 72
Glencoe.....	1,065 03	250 33	37 39	1,352 75	2,205 27
Goderich.....	21,361 52	7,429 41	4,668 00	33,458 93	37,753 75
Granton.....	2,040 89	250 37	286 05	2,577 31	3,336 66
Grantham Twp.....	1,234 59	845 38	3,034 31	5,114 28	5,788 41

**MUNICIPALITIES FOR YEAR ENDING DECEMBER 31st, 1920  
SYSTEM**

Gross Surplus	Gross Deficit	Depreciation	Net Surplus	Net Deficit	Total Accumulated Surplus	Total Accumulated Deficit
\$ 2,663 26		\$ 721 00	\$ 1,942 26		\$ 11,127 19	
2,172 12		414 00	1,758 12		4,478 62	
1,930 43		1,075 00	855 43		2,854 17	
4,059 36		1,006 00	3,053 36		3,501 23	
1,901 46		496 00	1,405 46		935 69	
1,655 50		420 00	1,235 50		7,458 26	
1,969 13		504 00	1,465 13		13,045 72	
3,139 84		938 00	2,201 84		4,090 18	
1,622 97		843 00	779 97			1,566 90
2,866 36		574 00	2,292 36		871 98	
3,468 87		3,963 00		494 13	29,839 43	
16,643 95		12,790 00	3,853 95		51,429 28	
803 35		1,812 00		1,008 65		1,458 78
2,389 93		351 00	2,038 93		567 04	
697 96		305 00	392 96			931 93
225 59		170 00	55 59		642 56	
1,306 23		445 00	861 23		5,115 25	
31,257 01		7,682 00	23,575 01		20,512 07	
2,590 57		1,356 00	1,234 57		1,512 41	
1,754 62		292 00	1,462 62			3,208 09
934 95		501 84	433 11		391 11	
275 40		164 00	111 40		975 96	
361 28		134 00	227 28			66 90
	120 84	2,112 00		2,232 84		2,020 51
890 18		273 00	617 18		2,145 58	
852 81		393 00	459 81		865 76	
5,224 59		683 00	4,541 59		5,661 45	
618 94		191 00	427 94			429 11
492 05		243 00	249 05			358 44
6,634 17		4,132 00	2,502 17		18,016 12	
1,122 07		2,275 00		1,152 93	1,429 92	
1,702 83		489 00	1,213 83		4,851 87	
4,092 54		1,248 00	2,844 54		10,380 27	
2,754 68		870 00	1,884 68		6,525 19	
644 18		387 00	257 18			2,784 53
10,190 54		4,638 00	5,552 54		7,672 43	
3,647 52		879 00	2,768 52		7,431 64	
757 49		1,090 00		332 51	4,185 96	
3,106 53		1,033 00	2,073 53		4,952 73	
29,333 16		11,959 00	17,374 16		104,389 29	
8,556 31		2,031 00	6,525 31		28,141 33	
852 52			852 52		1,568 81	
4,294 82		3,956 00	338 82		22,219 94	
759 35		202 00	557 35		535 90	
674 13		440 30	233 83			1,925 92

Municipality	Power Purchased	Operation and Maintenance	Debenture Charges and Interest	Total Operation	Revenues
Guelph.....	\$71,075 42	36,735 58	7,650 88	115,461 88	132,814 97
Hagersville.....	7,350 94	1,727 75	335 66	9,414 35	13,815 40
Hamilton.....	283,321 68	149,294 75	74,613 98	507,230 41	578,570 85
Harriston.....	10,971 20	2,056 19	1,564 56	14,591 95	15,826 49
Hensall.....	3,393 45	734 92	872 92	5,001 29	5,670 36
Hespeler.....	8,922 09	5,186 90	2,709 36	16,818 35	18,204 11
Highgate.....	2,466 02	304 32	326 21	3,096 55	3,985 39
Ingersoll.....	24,478 35	10,259 48	3,345 53	38,083 36	46,259 53
Kitchener.....	130,187 39	39,602 53	15,676 40	185,466 32	226,321 94
Lambeth.....	1,277 46	202 58	331 26	1,811 30	2,374 16
Listowel.....	16,048 92	5,371 06	3,480 95	24,900 93	26,149 15
London.....	225,905 12	133,790 95	60,816 15	420,512 22	497,166 68
Louth Twp.....	.....	339 35	428 12	767 47	608 61
Lucan.....	5,577 59	1,841 39	711 25	8,130 23	10,376 70
Lynden.....	3,794 56	154 54	378 63	4,327 73	5,214 69
Markham.....	1,656 78	825 29	665 28	3,147 35	4,498 73
Milton.....	17,960 50	2,960 52	2,178 35	23,099 37	24,401 67
Milverton.....	9,395 97	1,133 01	662 68	11,191 66	12,964 19
Mimico.....	6,716 60	5,659 96	1,944 99	14,321 55	19,251 55
Mitchell.....	6,048 86	3,133 63	1,788 30	10,970 79	16,208 49
Moorefield.....	1,730 12	139 72	391 99	2,261 83	2,668 74
Mount Brydges.....	1,500 93	166 06	272 43	1,939 42	2,819 78
Niagara-on-the-Lake.....	4,257 81	3,657 11	1,522 54	9,437 46	12,036 56
Niagara Falls.....	38,754 10	30,089 99	14,550 43	83,394 52	103,582 58
New Hamburg.....	6,737 44	2,618 24	1,088 73	10,444 41	13,115 91
New Toronto.....	84,628 66	7,488 30	.....	92,116 96	108,418 15
Norwich.....	7,274 43	7,211 47	790 30	15,276 20	20,430 77
Oil Springs.....	4,206 09	599 16	996 83	5,802 08	7,110 31
Otterville.....	1,482 04	206 18	375 89	2,064 11	3,917 13
Palmerston.....	5,477 12	1,976 78	2,040 43	9,494 33	14,313 60
Parkhill.....	1,948 86	355 55	687 35	2,991 76	4,199 13
Paris.....	13,643 00	7,601 15	6,247 88	27,492 03	34,389 38
Petrolia.....	14,819 20	7,279 25	3,873 05	25,971 50	36,563 02
Plattsville.....	3,704 74	368 65	366 35	4,439 74	5,601 59
Port Colborne.....	3,860 24	3,069 53	3,395 63	10,325 40	11,301 92
Port Credit.....	2,135 05	1,443 34	493 23	4,071 62	5,953 98
Port Dalhousie.....	2,824 98	2,475 74	1,329 35	6,630 07	7,412 90
Port Stanley.....	7,065 21	4,733 00	776 95	12,575 16	14,112 37
Preston.....	30,575 23	12,748 61	7,591 82	50,915 66	56,327 80
Princeton.....	1,140 19	153 12	288 01	1,581 32	1,863 43
Ridgetown.....	6,591 24	2,298 01	1,506 78	10,396 03	15,901 13
Rockwood.....	2,315 39	484 40	342 71	3,142 50	3,687 42
Rodney.....	2,379 44	596 84	572 99	3,549 27	5,652 12
St. George.....	2,201 20	335 64	288 68	2,825 52	4,844 70

Gross Surplus	Gross Deficit	Depreciation	Net Surplus	Net Deficit	Accumulated Surplus	Accumulated Deficit
17,353 09		11,050 00	6,303 09		142,609 25	
4,401 05		668 00	3,733 05		11,694 10	
71,340 44		54,365 72	16,974 72		142,990 79	
1,234 54		724 00	510 54			986 67
669 07		498 00	171 07			479 35
1,385 76		1,800 00		414 24	6,092 75	
888 84		274 00	614 84		1,246 73	
8,176 17		3,825 00	4,351 17		48,653 55	
40,855 62		17,357 00	23,498 62		139,295 45	
562 86		204 00	358 86		611 39	
1,248 22		1,700 00		451 78	3,692 23	
76,654 46		52,593 56	24,060 90		386,876 78	
	158 86	64 00		222 86	51 87	
2,246 47		569 00	1,677 47		7,007 86	
886 96		215 00	671 96			794 34
1,351 38			1,351 38		1,351 38	
1,302 30		1,428 00		125 70	15,853 57	
1,772 53		527 00	1,245 53		5,970 79	
4,930 00		2,183 00	2,747 00		14,966 65	
5,237 70		1,784 00	3,453 70		15,901 58	
406 91		179 00	227 91			16 06
880 36		207 00	673 36		1,410 78	
2,599 10		420 00	2,179 10		4,495 35	
20,188 06		10,164 50	10,023 56		53,410 55	
2,671 50		1,155 00	1,516 50		10,114 63	
16,301 19		1,905 00	14,396 19		74,341 11	
5,154 57		812 00	4,342 57		15,625 30	
1,308 23		443 00	865 23		379 77	
1,853 02		263 00	1,590 02		2,665 44	
4,819 27		889 00	3,930 27		3,708 76	
1,207 37			1,207 37		1,207 37	
6,897 35		3,676 00	3,221 35		11,534 35	
10,591 52		2,414 00	8,177 52		11,076 85	
1,161 85		221 00	940 85			883 72
976 52			976 52		976 52	
1,882 36		674 00	1,208 36		6,145 01	
782 83		613 00	169 83			981 26
1,537 21		969 00	568 21		6,658 69	
5,412 14		5,390 00	22 14		26,140 14	
282 11		139 00	143 11			1,048 93
5,505 10		940 00	4,565 10		17,485 17	
544 92		376 00	168 92		2,369 24	
2,102 85		397 00	1,705 85		2,738 76	
2,019 18		260 00	1,759 18		4,451 00	

Municipality	Power Purchased	Operation and Maintenance	Debenture Charges and Interest	Total Operation	Revenues
St. Jacob's . . . . .	\$2,075 55	271 21	496 49	2,843 25	4,234 37
St. Mary's . . . . .	20,326 52	6,575 94	4,794 07	31,696 53	34,385 60
St. Thomas . . . . .	58,936 05	30,639 90	6,870 11	96,446 06	126,800 15
St. Catharines . . . . .	54,851 62	31,383 24	15,526 58	101,761 44	131,374 64
Sarnia . . . . .	85,966 39	35,388 72	19,961 44	141,316 55	196,346 81
Seaforth . . . . .	12,783 27	2,890 58	1,108 14	16,781 99	20,389 15
Simcoe . . . . .	4,416 40	2,640 68	1,552 73	8,609 81	14,661 85
Springfield . . . . .	1,814 34	297 56	1,022 46	3,134 36	3,472 47
Stamford Twp. . . . .	5,468 99	4,542 27	2,190 90	12,202 16	15,464 96
Scarboro Twp. . . . .	3,722 74	3,413 06	5,284 95	12,420 75	14,675 93
Strathroy . . . . .	12,122 08	3,790 96	3,452 49	19,365 53	29,409 13
Stratford . . . . .	48,593 60	25,332 91	17,625 66	91,552 17	113,540 01
Tavistock . . . . .	8,472 75	666 19	31 89	9,170 83	12,786 32
Thamesford . . . . .	3,589 17	558 41	524 96	4,672 54	6,455 87
Thamesville . . . . .	2,653 26	506 26	910 10	4,069 62	5,477 06
Thorndale . . . . .	3,942 78	286 81	320 36	4,549 95	5,328 88
Tilbury . . . . .	3,635 27	1,470 60	1,246 93	6,352 80	7,647 17
Tillsonburg . . . . .	17,481 57	6,660 42	2,294 46	26,436 45	34,745 27
Toronto . . . . .	974,827 92	967,101 03	654,745 10	2,596,674 05	3,090,622 69
Toronto Twp. . . . .	4,911 00	3,679 44	3,979 26	12,569 70	18,641 08
Vaughan Twp. . . . .	1,817 38	178 70	2,544 48	4,540 56	3,861 52
Walkerville . . . . .	117,586 40	39,507 85	18,703 57	170,797 82	217,450 60
Wallaceburg . . . . .	26,426 93	5,903 77	4,066 90	36,397 60	54,941 95
Waterdown . . . . .	3,342 48	961 68	1,335 99	5,640 15	8,522 60
Waterford . . . . .	3,789 51	1,144 57	1,684 79	6,618 87	8,727 05
Waterloo . . . . .	24,149 70	15,527 63	4,142 19	43,819 52	52,440 24
Watford . . . . .	4,930 40	595 51	973 76	6,499 67	8,395 47
Welland . . . . .	46,965 89	21,571 84	15,873 25	84,410 98	94,732 81
Wellesley . . . . .	4,293 85	530 49	572 46	5,396 80	6,295 82
West Lorne . . . . .	3,600 75	648 34	601 68	4,850 77	8,780 83
Weston . . . . .	22,091 04	5,249 69	1,061 96	28,402 69	40,117 47
Windsor . . . . .	191,423 61	117,055 60	37,703 79	346,183 00	442,754 82
Woodbridge . . . . .	4,790 94	482 59	480 50	5,754 03	8,424 28
Woodstock . . . . .	34,269 52	18,376 86	5,075 78	57,722 16	73,806 31
Wyoming . . . . .	1,957 86	421 04	641 39	3,020 29	3,694 81
Zurich . . . . .	3,424 54	403 69	312 11	4,140 34	5,727 02
Total . . . . .	3,344,747 49	2,031,557 56	1,184,802 94	6,561,107 99	7,982,614 04

## THUNDER BAY

Port Arthur . . . . .	108,230 49	45,511 39	44,358 21	198,100 09	273,635 74
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Gross Surplus	Gross Deficit	Depreciation	Net Surplus	Net Deficit	Accumulated Surplus	Accumulated Deficit
\$ 1,391 12		\$ 259 00	\$ 1,132 12		\$ 2,905 09	
2,689 07		3,775 00		1,085 93	3,586 66	
30,354 09		12,069 00	18,285 09		152,952 55	
29,613 20		12,794 00	16,819 20		89,677 62	
55,030 26		10,141 00	44,889 26		82,887 66	
3,607 16		1,963 00	1,644 16		21,297 99	
6,052 04		1,544 00	4,508 04		13,346 52	
338 11			338 11		1,419 28	
3,262 80		1,905 50	1,357 30		9,363 14	
2,255 18		2,394 00		138 82		1,635 77
10,043 60		2,073 00	7,970 60		21,599 92	
21,987 84		11,951 00	10,036 84		45,190 32	
3,615 49		469 00	3,146 49		13,949 24	
1,783 33		355 00	1,428 33		1,638 65	
1,407 44		494 00	913 44		28 85	
778 93		185 00	593 93		97 16	
1,294 37		494 00	800 37			2,862 60
8,308 82		2,731 00	5,577 82		20,106 55	
493,948 64		379,503 36	114,445 28		221,073 24	
6,071 38		3,864 00	2,207 38		4,562 43	
	679 04	307 00		986 04		2,724 25
46,652 78		9,624 00	37,028 78		94,341 69	
18,544 35		2,628 00	15,916 35		25,438 86	
2,882 45		1,211 00	1,671 45		3,915 09	
2,108 18		740 00	1,368 18		8,239 66	
8,620 72		6,334 33	2,286 39		43,229 46	
1,895 80		514 00	1,381 80		1,683 04	
10,321 83		9,736 00	585 83		12,745 37	
899 02		326 00	573 02		2,581 71	
3,930 06		392 00	3,538 06		5,242 20	
11,714 78		3,056 00	8,658 78		35,540 11	
96,571 82		15,771 00	80,800 82		92,657 09	
2,670 25		630 00	2,040 25		7,318 50	
16,084 15		8,131 00	7,953 15		91,852 64	
674 52		344 00	330 52			1,771 49
1,586 68		262 00	1,324 68		4,311 86	
1,422,464 79	958 74	769,787 11	660,365 37	8,646 43	2,726,904 00	28,935 55

## SYSTEM

75,535 65		11,492 00	64,043 65		193,494 62	
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## SEVERN

Municipality	Power Purchased	Operation and Maintenance	Debenture Charges and Interest	Total Operation	Revenue
Alliston . . . . .	\$ 8,812 29	\$ 1,782 92	\$ 2,968 48	\$ 13,563 69	\$ 14,123 77
Barrie . . . . .	19,973 83	5,787 89	3,476 93	29,238 65	40,100 56
Beeton . . . . .	7,055 91	413 84	1,166 71	8,636 46	7,170 95
Bradford . . . . .	5,441 62	800 81	1,546 43	7,788 86	4,971 49
Coldwater . . . . .	2,266 49	753 71	632 47	3,652 67	4,598 43
Collingwood . . . . .	47,258 00	6,722 89	1,665 66	55,646 55	51,326 04
Cookstown . . . . .	3,204 59	387 95	1,020 10	4,612 64	4,577 08
Creemore . . . . .	3,185 30	504 64	474 24	4,164 18	5,257 89
Elmvale . . . . .	4,379 26	958 34	445 94	5,783 54	6,840 08
Midland . . . . .	31,831 55	7,709 40	4,549 12	44,090 07	50,629 38
Penetang . . . . .	23,367 70	4,082 37	2,408 44	29,858 51	32,963 47
Port McNicoll . . . . .	1,826 70	499 68	559 91	2,886 29	2,623 64
Stayner . . . . .	4,047 91	796 35	1,249 52	6,093 78	8,414 82
Thornton . . . . .	1,232 81	104 41	472 51	1,809 73	1,210 86
Tottenham . . . . .	3,590 00	436 90	1,196 12	5,223 02	3,569 26
Victoria Harbor . . . . .	2,138 45	793 79	536 12	3,468 36	3,303 35
Waubashene . . . . .	963 72	344 41	310 61	1,618 74	1,959 21
Total . . . . .	170,576 13	32,880 30	24,679 31	228,135 74	243,640 28

## ST. LAWRENCE

Brockville . . . . .	49,713 84	26,016 83	17,622 28	93,352 95	88,898 69
Chesterville . . . . .	11,569 91	1,166 73	1,032 20	13,768 84	14,621 89
Prescott . . . . .	10,779 58	5,113 93	2,254 35	18,147 86	19,423 56
Williamsburg . . . . .	1,020 79	197 09	277 16	1,495 04	1,550 52
Winchester . . . . .	6,470 61	1,804 59	959 77	9,234 97	8,763 55
Total . . . . .	79,554 73	34,299 17	22,145 76	135,999 66	133,258 21

## WASDELL'S

Beaverton . . . . .	6,161 84	1,342 01	1,532 92	9,036 77	11,113 94
Brechin . . . . .	3,309 97	437 31	396 11	4,143 39	3,250 09
Cannington . . . . .	5,203 62	1,126 62	1,320 63	7,650 87	8,015 87
Kirkfield . . . . .	413 70	136 21	22 69	572 60	678 26
Sunderland . . . . .	4,053 83	754 13	1,201 52	6,009 48	5,110 18
Woodville . . . . .	3,885 59	521 32	668 69	5,075 60	5,032 11
Total . . . . .	23,028 55	4,317 60	5,142 56	32,488 71	33,200 45

## SYSTEM

Gross Surplus	Gross Deficit	Depreciation	Net Surplus	Net Deficit	Accumulated Surplus	Accumulated Deficit
\$ 560 08		\$ 1,299 00		\$ 738 92		\$ 5,982 04
10,861 91		4,233 50	6,628 41		67,412 25	
	1,465 51	577 00		2,042 51		6,341 52
	2,817 37	724 00		3,541 37		7,843 22
	945 76	497 00	448 76			386 16
	4,320 51	3,750 00		8,070 51	41,675 18	
	35 56	486 00		521 56		2,205 11
1,093 71		358 00	735 71		5,694 17	
1,056 54		523 00	533 54		2,881 25	
6,539 31		5,826 25	713 06		26,073 34	
3,104 96		2,764 00	340 96		8,672 22	
	262 65	255 00		517 65		2,491 47
2,321 04		641 00	1,680 04		2,198 22	
	598 87	299 00		897 87		2,146 25
	1,653 76	418 00		2,071 76		4,491 90
	165 01	342 00		507 01	1,068 95	
340 47		194 00	146 47		612 22	
26,823 78	11,319 24	23,186 75	11,226 95	18,909 16	156,287 80	31,887 67

## SYSTEM

	4,454 26	3,675 00		8,129 26		7,201 77
853 05		490 00	363 05			6,124 44
1,275 70		2,302 00		1,026 30	23,349 48	
55 48		118 00		62 52		665 37
	471 42	536 00		1,007 42		1,895 15
2,184 23	4,925 68	7,121 00	363 05	10,225 50	23,349 48	15,886 73

## SYSTEM

2,077 17		538 00	1,539 17			1,374 49
	893 30	138 00		1,031 30		3,751 71
365 00		542 00		177 00		5,024 90
105 66			105 66		105 66	
	899 30	237 00		1,136 30		5,432 62
	43 49	170 00		213 49		3,994 25
2,547 83	1,836 09	1,625 00	1,644 83	2,558 09	105 66	19,577 97

## EUGENIA

Municipality	Power Purchased	Operation and Maintenance	Debenture Charges and Interest	Total Operation	Revenues
Arthur . . . . .	11,349 83	1,051 85	1,886 75	14,288 43	9,884 74
Chatsworth . . . . .	1,650 22	319 01	541 21	2,510 44	2,010 14
Chesley . . . . .	12,679 37	1,304 87	2,601 85	16,586 09	15,828 49
Dundalk . . . . .	4,373 18	817 38	468 07	5,658 63	5,621 98
Durham . . . . .	4,958 47	1,051 82	1,728 68	7,738 97	8,932 45
Elmwood . . . . .	2,882 66	193 75	648 90	3,725 31	3,029 57
Grand Valley . . . . .	4,710 33	391 30	988 50	6,090 13	5,681 31
Flesherton . . . . .	2,550 79	240 06	478 28	3,269 13	3,211 00
Hanover . . . . .	26,087 94	3,807 89	5,319 04	35,214 87	29,524 82
Holstein . . . . .	1,484 58	147 75	382 99	2,015 32	1,206 15
Markdale . . . . .	\$ 2,973 66	\$ 986 00	\$ 953 99	\$ 4,913 65	\$ 6,302 37
Mount Forest . . . . .	10,652 13	1,921 19	2,611 45	15,184 77	12,719 87
Neustadt . . . . .	5,030 57	464 15	1,336 71	6,831 43	4,814 86
Orangeville . . . . .	9,745 84	2,020 37	3,088 37	14,854 58	12,954 42
Owen Sound . . . . .	47,256 74	16,041 95	8,614 29	71,912 98	74,698 89
Shelburne . . . . .	8,674 95	1,191 42	1,689 57	11,555 94	9,970 26
Tara . . . . .	5,002 53	507 01	1,186 83	6,696 37	4,476 37
Total . . . . .	162,063 79	32,457 77	34,525 48	229,047 04	210,867 69

## OTTAWA

Ottawa . . . . .	96,791 65	111,381 95	41,927 74	250,101 34	305,310 79
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## MUSKOKA

Gravenhurst . . . . .	7,022 07	4,586 22	4,089 04	15,697 33	15,875 07
Huntsville . . . . .	19,586 93	3,571 85	2,496 92	25,655 70	27,470 67
Total . . . . .	26,609 00	8,158 07	6,585 96	41,353 03	43,345 74

## RIDEAU

Carleton Place . . . . .	23,033 09	7,311 45	3,908 96	34,253 50	34,170 08
Perth . . . . .	20,083 77	5,002 57	7,885 69	32,972 03	37,329 39
Smith's Falls . . . . .	23,848 30	24,313 78	14,586 20	62,748 28	58,761 34
Total . . . . .	66,965 16	36,627 80	26,380 85	129,973 81	130,260 81

## TRENT

Bloomfield . . . . .	2,365 19	270 53	707 58	3,343 30	3,683 12
Kingston . . . . .	48,401 18	49,335 12	22,207 55	119,943 85	151,501 76
Omemee . . . . .	1,241 10	324 50	1,092 18	2,657 78	2,822 99
Peterborough . . . . .	63,440 16	50,810 36	15,207 96	129,458 48	147,516 57
Piaget . . . . .	17,779 92	6,192 96	894 44	24,867 32	37,900 01
Wellington . . . . .	3,220 09	939 74	1,148 64	5,308 47	5,471 30
Lakefield . . . . .	1,653 24	516 84	.....	2,170 08	2,871 43
Total . . . . .	138,100 88	108,390 05	41,258 35	287,749 28	351,767 18
Total—All Systems . . . . .	4,216,667 87	2,445,581 66	1,431,807 16	8,094,056 69	9,707,900 93

## SYSTEM

Gross Surplus	Gross Deficit	Depreciation	Net Surplus	Net Deficit	Accumulated Surplus	Accumulated Deficit
4,403 69	927 00			5,330 69		13,450 93
500 30	221 00			721 30		1,655 36
757 60	1,111 00			1,868 60		5,670 32
36 65	386 00			422 65		733 48
1,193 48	870 00		323 48			4,583 41
695 74	259 00			954 74		1,695 12
408 82	473 00			881 82		2,351 55
58 13	306 00			364 13		2,373 38
5,690 05	2,536 00			8,226 05		5,509 61
809 17	122 00			931 17		3,895 96
\$ 1,388 72	\$ 573 00	\$ 815 72		\$ 2,249 59		
2,464 90	1,109 00			3,573 90		10,912 39
2,016 57	502 00			2,518 57		4,177 60
1,900 16	1,313 00			3,213 16		9,436 05
2,785 91	6,006 25			3,220 34	51,605 13	
1,585 68	822 00			2,407 68		4,085 74
2,220 00	545 00			2,765 00		7,737 02
5,368 11	23,547 46	18,081 25	1,139 20	37,399 80	53,854 72	78,267 92

## SYSTEM

55,209 45	.....	42,800 00	12,409 45	.....	99,699 11	.....
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## SYSTEM

177 74	.....	2,170 00	.....	1,992 26	.....	8,944 17
1,814 97	.....	884 00	930 97	.....	.....	6,560 32
1,992 71	.....	3,054 00	930 97	1,992 26	.....	15,504 49

## SYSTEM

4,357 36	83 42	1,891 00	.....	1,974 42	145 58	.....
4,357 36	3,986 94	2,493 00	1,864 36	504 98	20,501 30	
4,357 36	4,070 36	5,615 00	.....	9,601 94	650 56	20,501 30

## SYSTEM

339 82	.....	367 00	.....	27 18	.....	240 82
31,557 91	.....	11,958 00	19,599 91	.....	162,413 09	.....
165 21	.....	455 00	.....	289 79	.....	651 84
18,058 09	.....	9,177 00	8,881 09	.....	41,866 53	.....
13,032 69	.....	653 00	12,379 69	.....	38,910 99	.....
162 83	.....	555 00	.....	392 17	.....	427 43
701 35	.....	701 35	.....	701 35	.....	.....
64,017 90	.....	23,165 00	41,562 04	709 14	243,891 96	1,320 09
1,660,501 81	46,657 57	910,311 11	795,549 87	92,016 74	3,498,237 91	211,881 72

## CONSOLIDATED BALANCE SHEETS,

	1913	1914	1915
ASSETS			
Lands and Buildings.....	45	69	99
\$    c.	\$    c.	\$    c.	
626,707 34	791,732 20	873,838 18	
Sub-Station Equipment.....	1,090,875 69	1,476,087 84	1,582,062 56
Distribution System, Overhead.....	2,690,834 74	3,422,763 93	4,234,626 05
Distribution System, Underground.....	644,514 24	807,153 53	928,420 77
Line Transformers.....	615,546 20	787,613 52	981,754 70
Meters.....	840,606 64	1,172,475 11	1,418,165 08
Street Light Equipment, Regular.....	900,614 80	1,071,255 37	1,309,628 49
Street Light Equipment, Ornamental.....	62,765 34	270,386 55	197,644 82
Miscellaneous Construction Expenses.....	866,551 89	2,062,035 90	1,701,182 66
Steam or Hydraulic Plant.....	1,401,175 28	420,108 33	461,651 60
Old Plant.....	341,277 00	619,513 12	1,184,372 86
Total Plant.....	10,081,469 16	12,901,125 40	14,873,347 77
Bank and Cash Balance.....	450,887 97	422,350 12	284,653 96
Securities and Investments.....			
Accounts Receivable.....	344,487 95	561,873 08	602,920 69
Inventories.....	540,274 58	615,226 76	726,556 76
Sinking Fund on Local Debentures.....	431,747 27	625,217 03	868,983 78
Equity in Hydro System.....			
Equity in Rural Lines.....			
Other Assets.....	58,959 93	123,410 97	326,801 11
H.E.P.C. Operating Account.....			
Total Assets.....	11,907,826 86	15,249,203 36	17,683,264 07
LIABILITIES:			
Debenture Balance.....	8,711,308 37	10,678,078 36	11,831,811 03
Accounts Payable.....	1,553,711 45	1,682,150 29	2,040,038 01
Bank Overdraft.....	160,919 16	228,622 50	292,106 44
Other Liabilities.....	42,412 81	113,838 66	37,388 31
H.E.P.C. Operating Account.....			
Total Liabilities.....	10,468,351 79	12,702,689 81	14,201,343 79
RESERVES:			
Debentures Paid.....	202,751 26	320,129 10	394,466 22
Sinking Fund Reserve.....	431,747 27	625,217 03	868,983 78
Reserve for Equity in Hydro System.....			
Reserve for Equity in Rural Lines.....			
Depreciation Reserve.....	478,145 88	850,618 07	1,337,739 73
Total Reserves.....			
Surplus.....	326,830 66	750,549 35	880,730 55
Total.....	11,907,826 86	15,249,203 36	17,683,264 07
Percentage of Net Debt to Total Assets	88.0%	83.0%	80.3%

## ALL HYDRO MUNICIPALITIES

1916	1917	1918	1919	1920
128	143	166	191	195
\$ c.				
1,335,936 33	1,546,241 41	1,859,888 69	1,995,545 83	2,175,568 24
1,934,626 12	2,471,293 82	2,820,488 70	2,915,125 56	3,231,050 80
4,832,353 27	6,080,073 42	6,627,237 39	7,445,820 31	8,554,480 18
1,095,709 62	1,157,059 90	1,216,288 59	1,206,296 88	1,313,369 29
1,179,132 07	1,483,839 44	1,772,691 35	2,073,113 45	2,556,399 92
1,711,299 49	1,999,095 48	2,238,143 70	2,587,566 32	3,047,021 98
1,251,057 13	1,237,734 69	1,200,625 65	1,206,638 71	1,268,795 86
306,388 95	361,975 74	531,502 61	546,497 68	557,678 13
2,059,263 42	2,184,015 84	2,395,096 50	2,530,101 08	2,693,388 99
864,500 01	896,753 20	214,575 75	986,200 57	757,194 47
759,748 66	649,852 51	1,476,413 00	805,959 89	854,368 79
17,330,015 07	20,077,935 45	22,352,951 93	24,298,866 28	27,009,316 65
1,061,029 90	340,026 50	391,194 91	462,437 23	943,623 12
695,152 23	1,285,097 33	1,124,018 44	627,076 53	341,855 88
764,504 59	1,261,398 36	972,996 96	1,356,565 14	1,447,313 52
1,166,017 73	1,337,578 96	1,663,298 05	1,032,569 75	1,400,253 63
342,215 87	125,240 05	444,787 63	1,925,455 77	2,244,004 34
344,410 94			344,410 94	531,299 63
24,660 95			24,660 95	46,284 43
86,216 05			86,216 05	25,447 07
564,601 55			564,601 55	574,831 95
21,358,935 39	24,427,276 65	26,949,247 92	30,722,860 19	34,564,230 22
15,058,641 57	15,593,773 61	17,209,217 70	18,133,462 44	19,229,219 21
969,187 75	1,537,669 11	1,007,727 79	1,137,705 04	1,424,950 63
178,413 26	886,177 94	576,816 49	403,235 57	510,476 43
491,874 90	429,104 20	350,013 21	670,271 90	642,058 65
			283,221 62	409,463 27
16,698,117 48	18,446,724 86	19,143,775 19	20,627,896 57	22,216,168 19
549,778 59	694,797 90	920,076 56	1,328,657 68	1,439,009 35
1,165,785 94	1,340,615 38	1,662,602 69	1,754,020 37	2,246,474 47
344,410 94			344,410 94	531,299 63
29,460 95			29,460 95	46,284 43
1,843,804 68	2,463,723 83	3,133,550 17	3,750,162 28	4,796,927 39
1,101,448 70	1,481,414 68	2,089,243 31	7,206,712 22	9,059,995 27
2,888,251 40			2,888,251 40	3,288,066 76
21,358,935 39	24,427,276 65	26,949,247 92	30,722,860 19	34,564,230 22
78.4%	75.5%	71.0%	67.9%	65.3%



# Technical Section

## Measuring Maximum Demand in Volt-Amperes

By Perry A. Borden

*Laboratories, Hydro-Electric Power Commission of Ontario*

**W**HILE the importance of the quantity "Maximum Demand" in the establishment of logical charges for the use of electrical energy is well understood, there is sometimes apparent a tendency to overlook the nature of the unit upon which the demand measurement is based.

In the earliest type of demand meters the indications were obtained from the action of current alone, and the demands obtained were what is known as "ampere demand." Of late years most of the demand meters on the market operated upon the wattmeter principle, and "watt demands" were obtained. It is known, however, that neither amperes nor watts furnish a true basis upon which to establish the shares of the burden or fixed charges which should be borne by respective energy customers. The constantly multiplying number of types of demand indicators, measuring various electrical quantities and determin-

ing demands according to various laws has in the past two decades given rise to much confusion and misunderstanding.

With these facts in view there was undertaken some years ago in the Laboratories of the Hydro-Electric Power Commission, an investigation to determine just what might be expected from the several methods of measuring demand. This work was carried on in great detail and included both theoretical studies of the methods of demand determination and extended tests on a variety of actual loads. The results of these investigations were of a most interesting nature and served to bring to light a number of facts whose significance had not before been fully realized. Among these, it was pointed out that the readings of logarithmic (thermal) meters differed little from the arithmetical average of load when taken over a continued period, and that, such deviations as did exist tended to bring the indicating into agreement with a more logical

quantity than was the arithmetical average, which is the common conception of demand. It was further pointed out that the true basis for demand measurement cannot, under practical working conditions, be accurately determined; and that it is necessary for some compromise to be made. The tests showed that the quantity whose value approached nearest to the desired compromise was that which is known as "volt-ampères." The logical conclusion, then is that a satisfactory indication of demand may be obtained by a measurement of *volt-ampere demand* upon a *logarithmic basis*.

Now, while the Lincoln thermal demand meter has made possible the measurement of watt demands on a logarithmic basis, it has not as yet been found practicable to produce a device which would infallibly measure the volt-ampères in a circuit, and the development of a volt-ampere demand meter has been consequently delayed.

The exact measurement of volt-ampères is a problem which presents many difficulties, not the least of which is the finding of a satisfactory definition of the quantity. In a single-phase circuit, the product of the voltage across the circuit by the current flowing therein is manifestly the volt-ampères, and this quantity may be determined by the use of a voltmeter and an ammeter properly connected. Even here, however, it is very difficult to conceive of an instrument which will give an indication of volt-ampères without the simultaneous use of two separate measuring instruments. In polyphase circuits, the matter is much more complicated; and the true meaning of the term as ap-

plied to such circuits has been the subject of much controversy. It has been said that the term "volt-ampères" as applied to a polyphase unbalanced load is meaningless, as it was not practicable to obtain its value from the indications of voltmeters and ammeters in the circuit. There can be applied to the term, however, a very definite meaning, which not only has a real significance but can be determined for either single-phase or polyphase circuits, and is invariable in its value, not matter how the various components of the load may be distributed among the several phases.

The following explanations, though they cannot be taken as strictly orthodox definitions, will serve for the purpose of the present discussion to put plainly before the reader the significance of the three quantities which are now under consideration:

(1) A wattmeter connected into circuit in such a way as to carry the line current in its current coil and have the line voltage applied to its potential circuit will indicate *Watts*, (or working volt-ampères).

(2) A wattmeter connected so as to carry the same current as above and to have its potential circuit energized by a voltage equal to but ninety electrical degrees out of phase with the line voltage will indicate *Reactive (or idle) Volt-Ampères*.

(3) A wattmeter connected in such a way that its current coil carries the line current, and its potential circuit is energized by a voltage equal to the line voltage, but in phase with the line current will indicate *Volt-Ampères*.

A glance at the vector diagram given in Figure 1 will serve to show the meaning of these terms. Suppose

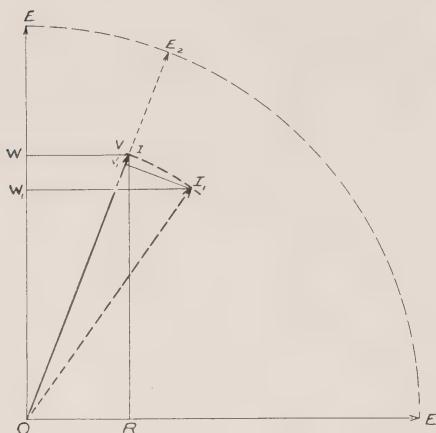


Figure 1

OE to represent the voltage of a circuit and OI the current flowing; then a wattmeter carrying a current OI with voltage OE applied to its potential circuit would give an indication represented by OW, the projection of the current vector upon the voltage vector, and this would be an indication of the watts in the circuit. Now if instead of OE, we were to apply a voltage  $OE_1$ , being equal to but in quadrature with the line voltage, the indication of the wattmeter would be that quantity represented by OR. This quantity is what we know as "Reactive Volt-amperes." Now the actual volt-amperes of the circuit would be the quantity measured if the wattmeter were supplied with a voltage ( $OE_2$ ) which is equal to the line voltage but in phase with the current; and if such a voltage could be obtained the problem of volt-ampere measurement would be solved. But, while the line voltage is always present and the quadrature voltage can be obtained with little difficulty, there has not as yet been developed any type of transformer or other device which

will give a voltage equal or proportional to the line voltage and yet changing its phase angle with the lag or lead of the line current.

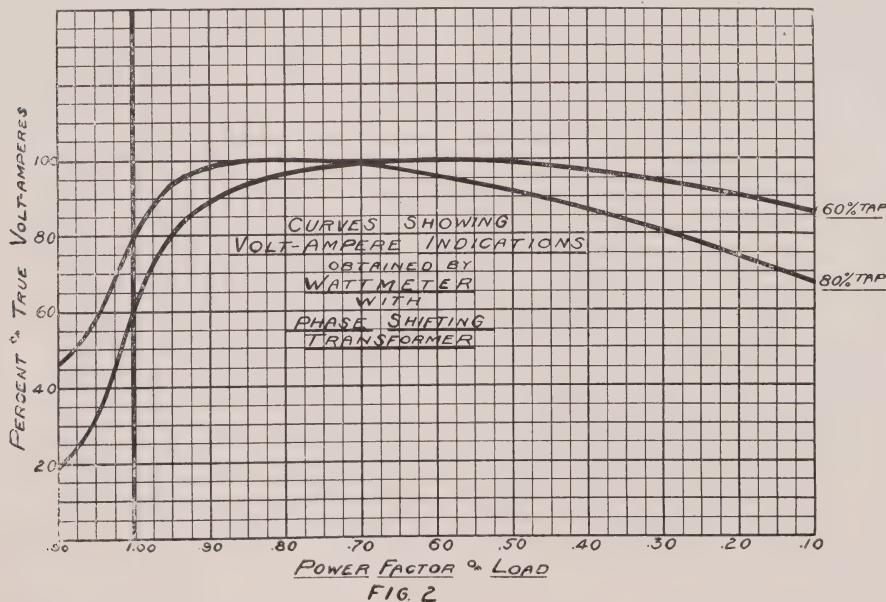
If simultaneous readings of the active volt-amperes (watts) and idle (reactive) volt-amperes be obtained, these quantities may be combined by taking the square root of the sum of the squares of their values, to give the volt-amperes; but the accuracy of this method is contingent upon the readings being simultaneous. This scheme is frequently used with graphic meters, where the reading of one instrument at any time can be compared with that of the other at the same time; but in the case of indicating demand meters there is the possibility of a considerable error where such a method is employed. There are many loads which continue fairly steady throughout the day, and lack the noon valley and other depressions which are characteristic of some factory loads. Now, there is generally a tendency for the voltage to be slightly high at times when the system load as a whole is light. This, while in no way affecting the kilowatt consumption of those customers whose load does not fall off, has the effect of increasing the value of their reactive volt-amperes. If a reactive volt-ampere demand meter is installed on such a load there is the probability of a maximum being recorded at the time of high voltage, while the maximum watt demand may occur at a time when the value of the reactive demand is considerably less. If these two quantities be combined, for the purpose of finding either volt-amperes or power factor, the result is unfavor-

able to the customer, and he is penalized for that over which he has no control.

As stated above, if it were possible to apply to a wattmeter a voltage which would remain in phase with the line current and equal to the line voltage, we would have an indication of volt-amperes in the circuit, but unfortunately such a voltage is not capable of easy production. If, however, a voltage is produced which is in phase with the current at one particular power factor, it has been found that the error introduced in volt-ampere indications, as the phase angle of the current swings through a considerable range is remarkably small. If, then, a wattmeter carrying the line current were to have applied to its voltage circuit a potential in phase with some chosen vector position of that current, the power factor might be varied several per cent. without introducing appreciable errors into the volt-ampere indication. This is shown by

reference to Figure 1, where the current  $I$  is considered as having swung into a new position  $I_1$ . It will at once be seen that, whereas the wattmeter reading, using the line voltage  $E$ , has changed from  $OW$  to  $OW_1$ , representing the actual change in power factor, the reading using the voltage  $E_2$  has changed only from the value  $OV$  to the new value  $OV_1$ , a per cent. change very much less than the change in the power factor. Thus, by selecting a voltage which shall be equal to the line voltage and have a phase position corresponding to some power factor chosen as an average of the power factors at which we wish to make our determination, it is possible to obtain from a wattmeter, readings which will bear to the volt-amperes of the circuit a very close approximation, and one which is never in excess of the true value.

This method of obtaining approximate volt-amperes is the one which has been utilized by the Lincoln Meter



Company in the "phase-shifting transformer" which is being placed on the market for use in conjunction with their thermal demand meter. It comprises two small auto-transformers mounted in the one case and energized from the voltage of the circuit which is to be measured. These are so tapped that from them are obtainable voltages which, while representative in magnitude of the line voltages, are lagged to a phase angle corresponding to the power factor at which it is desired that the meter indicate volt-amperes. These voltages are applied to the potential circuits of the demand meter, the currents being connected in the ordinary way, when, if the proper phase rotation has been maintained, the meter will indicate approximate volt-ampere demand instead of watt demand. A simple method is under development where by the phase rotation may be determined, and if necessary, corrected.

The first model of the phase-lagging transformer which was submitted to the Laboratories was so tapped that it could be set for any one of three power factors; but a theoretical investigation, coupled with exhaustive tests showed that for all practical purposes such refinement was quite unnecessary, and that two properly chosen values would be sufficient to cope with practically all conditions which would be met with in ordinary practice. The device in its final form is tapped for power factors of 60 per cent. and 80 per cent., thus giving a range of accuracy well within the practical requirements of demand measurement. The curves shown in Figure 2 illustrate the degree with

which a true indication of volt-amperes may be approximated with this arrangement. It will be noted that the power factor may vary 10 to 15 per cent. on either side of the value for which the meter is compensated, and yet the errors be less than two per cent. of the true value; and by selecting the proper tap the scheme may be utilized on loads whose power factors lie anywhere between 40 per cent. and 90 per cent. with an error less than that permissible for watthour meters used for billing purposes.

While the phase-lagging transformer may be used with any wattmeter to give volt-ampere indications, there are certain limitations to its use which should be carefully noted and observed. While the power factor may vary considerably from time to time throughout the day as the load value changes, it usually happens that the maximum demand will occur from day to day at approximately the same value of power factor. Thus it will be seen that while the method described is quite permissible for demand determination, its use for general metering would have to be undertaken with great caution. A watthour meter so connected, while giving approximately correct results during the period of maximum demand, might be called upon to operate for many hours at an entirely different value of power factor, with the possible result that a very large proportion of the integrated load appearing on the dials would have been measured at a power factor entirely different from that for which the meter was compensated, thus introducing an error which not only might have a considerable magnitude

but would be very difficult of determination. The same holds good, though to a lesser degree in the case of indicating or graphic wattmeters.

Bearing in mind the limitations of this device as a compensator for the general measurement of volt-amperes, and remembering that volt-amperes as a quantity can only be considered as an approximation (though apparently the best approximation) to the true

basis upon which demands should be established, we may look upon the phase-shifting transformer used in conjunction with a demand meter as a long step toward ideal determination of demand. And maximum demand, properly based and correctly obtained is undoubtedly the truest indication of the share that the consumer of electrical energy should bear of the fixed charges upon the power plant.

## Power Factor

### Measurement of Kilovolt-Amperes

One of the most difficult questions, which the Managers of Electrical Distribution Systems are asked to explain, is, "What is Power Factor?" and, "Why a Power Customer should be penalized if the Power Factor of his load is low?" The question, "What is Power Factor?" is not by any means easy to explain, especially to the average power user, who, as a rule, is a non-technical man, and, as the explanation involves certain scientific principles known only to men having a knowledge of electricity and the principles of alternating currents, no matter how clearly the superintendent of a system might explain why a customer should be penalized on account of low Power Factor of his load, the customer is nearly always dissatisfied when called upon to pay a Power Factor penalty in his monthly bill.

Up-to-date meters for the measurement of electric power have been constructed so as to measure kw. or energy, having no regard to the Power

Factor of the load so measured, it being necessary, and where a correction is to be made for the power factor of the load, to install an additional meter to measure the power factor, or a system of periodic tests must be made in connection therewith.

The measurement of kva. instead of kw., which thereby eliminates the measurement of power factor separate from the measurement of energy, has, for years, been the dream of electrical engineers. The realization of that dream has at last come true, and it has been the good fortune of the engineers of the Hydro-Electric Power Commission of Ontario to devolve a means of measuring kva. with sufficient accuracy to make the billing of power customers on the basis of kva., instead of kw. a practicable possibility.

The credit for the development of the scheme is due to Mr. P. A. Borden and Mr. J. J. Jeffery, engineers of the Hydro-Electric Power Commission, and, of course, Mr. Paul M. Lincoln, whose excellent demand

meter has really made the measurement of power loads possible at a reasonable cost.

This scheme does not include any new principles, and Mr. P. A. Borden pointed out in a report under date of January 15, 1921, that the method of lagging the current in the potential circuit of meters had already been used to a considerable extent with integrating meters of the induction type, and should be applicable to the Lincoln Meter. Mr. Borden further advised in his report, that the Lincoln Meter Company was engaged upon a series of investigations, which were expected to solve the problem of kva. measurement.

It remained, however, for Mr. J. J. Jeffery to point out that the problem was already solved, as results accurate enough for billing purposes could be obtained by using the lagging potential method in connection with the Lincoln Meter.

The measurement of kva. may, we believe, justly be considered as the most important step in connection with the measurement of electrical power that has been made in many years, and this important principle, which has been made practical for the measurement of commercial loads, will, without doubt, be adopted in the near future, by many electrical supply companies, not only on this continent, but in all parts of the world.

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## Oil Testing Equipment at The Laboratories

By W. B. Buchanan

As the technique in any branch of industry progresses, methods of tests and the equipment for carrying out the same undergo a process of being perfected and tests which not long ago were quite special and unusual become recognized as valuable and even absolutely necessary to the satisfactory maintenance of the equipment. The greater duty placed on the apparatus as well as the insistent demand for continuity of service and minimizing repair bills dictates that all such tests be clearly defined and standardized as soon as their value is determined.

The testing of insulating oil from the high tension equipment of the Commission has reached such a magnitude that the ingenuity of the Labor-

atory Assistants engaged thereon has been exercised in reducing the labor and cost, at the same time eliminating as many causes of error and non-uniformity of results as possible. The result is that an oil-testing set has been in service for some time which is quite satisfactory in its operation and unique in that it is the only one of its kind of which we know. In the test the operator places the sample of oil in a suitable cup, closes a switch and writes down the results of the test as indicated by a voltmeter at each breakdown, simply opening the switch when a sufficient number of readings have been taken. The greater part of the work is performed automatically as will be explained later.

A permanent testing-panel is supplied with suitable switches, terminals and an indicating voltmeter. The testing transformer is of 5 kva. rating 110-220/25,000-50,000 volts and is provided with an exploring coil winding of a 110-volt normal rating. Current limiting resistances are inserted in the high-tension leads to minimize the destructive effect of a short circuit on the transformer and also the carbonizing effect of a break-down on the oil under test. The oil is tested in a bakelite cup holding a little less than one-half pint, the terminals of the circuit immersed in oil being flat circular discs or spherical balls as desired. Thus two separate and independent tests may be made from one pint of oil and is usually done as a check on the results.

The feature of special interest in this equipment is the method of con-

trolling the voltage supply to the transformer, and this is done as follows:

The terminals of a potentiometer rheostat are supplied at approximately 220 volts, 25 cycles. The movable contact arm is motor driven and rotates at about fifteen revolutions per minute, and in doing so it gradually raises the voltage which may be applied to the transformer from zero to full line voltage, then drops it suddenly back to zero. Whether this voltage be actually applied to the oil or not depends on the condition in the test circuit as detected by a suitable system of relays. An overload relay serves to trip open the circuit to the transformer and thus clear the test circuit instantly on the break-down of the oil; slight disturbances or static discharges do not cause the circuit to open. When the controller handle re-



*Oil Testing Equipment at the Laboratories*

turns to the zero position another relay operates to close the test circuit. The sequence of events then on a routine test are regular and uniform and eliminates the personal equation which so often vitiates the results of oil-tests.

The operator rinses out the test-cup with the oil to be tested, fills it with oil and closes the switch. The voltage is then automatically raised at a fairly uniform rate until break-down takes place in the oil when the over-load relay operates and opens the circuit. Just about enough time is allowed for the carbonized particles to be cleared out of the gap, and the operator note the break-down voltage, when the circuit is reclosed and starts in again from zero voltage to repeat

the operation. This continues until a sufficient number of break-downs have been made to ensure a fairly accurate value having been obtained. The average of five values is usually taken as the break-down voltage of the oil.

The set may be operated manually also and is used regularly for a wide range of high potential tests, such as on rubber gloves, distribution and instrument transformers and various classes of insulation not in its final position. Provision is also made whereby an ammeter and wattmeter may be inserted in the primary of the transformer in order that characteristics of the high tension load may be determined.

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## Minutes of Meeting, Executive Committee, A. M. E. U.

The meeting was called to order at 2.30 p.m. in Room 312, Hydro-Electric Power Commission of Ontario's Administration Building.

Those present were, Messrs. M. J. McHenry, president; R. H. Martindale, P. B. Yates, H. F. Shearer, J. G. Archibald, R. H. Starr, G. J. Mickler, L. G. Ireland, R. T. Jeffery, T. C. James, J. F. S. Madden, H. O. Fisk and S. R. A. Clement, Secretary.

Moved by Mr. H. F. Shearer,

Seconded by Mr. R. H. Starr,

That the minutes of the last executive meeting be passed as published.  
*Carried.*

Mr. Wills MacLachlan spoke to the meeting in reference to Accident Pre-

vention and Health Promotion, and asked for the assistance of the Association in this work, suggesting that a committee be appointed to deal with the problem.

Moved by Mr. H. F. Shearer,

Seconded by Mr. R. H. Martindale,

That the president be authorized to appoint a committee to draft an amendment to the by-laws for approval at the June Convention, appointing a Standing Committee on Accident Prevention and Health Promotion.  
*Carried.*

Referring to the resolution passed at the January Convention of the Association, that a committee be appointed to report to the Ontario Municipal

Electrical Association on "A More Equitable System of Distribution of Hydro-Electric Power and A More Uniform Price," Mr. Yates reported as to the work done by that Committee. The Committee conferred with the Executive Committee of the Ontario Municipal Electrical Association and drafted the various resolutions on this subject that were passed by the O.M.E.A. at its annual meeting.

The secretary reported as to membership to date as follows:

There were 110 Utilities, members of the Association in 1920. Of these 73 Utilities have renewed their membership for 1921, while there are 10 new members, making a total of 83 Member Utilities for 1921. In 1920 there were 36 Commercial members, of which 25 have renewed for 1921, and one new membership subscription has been received, making a total to date of 26 Commercial members.

The following membership cards have been issued:

Class "A" .....	116
Class "B" .....	117
Commercial .....	85
Associate .....	54

Moved by Mr. P. B. Yates,  
Seconded by Mr. R. H. Martindale,  
That the Secretary's report be adopted. *Carried.*

Moved by Mr. H. F. Shearer,  
Seconded by Mr. P. B. Yates,  
That the following be elected as Associates:—N. D. Kribs, N. Curzon, R. H. Bergh, G. N. Taylor and V. A. Beacock; also that Gillespie Eden Co., be elected to Commercial Membership. *Carried.*

The Treasurer then reported as to the finances of the Association, giving

a balance of cash on hand of \$1,531.08.

Moved by Mr. J. G. Archibald,  
Seconded by Mr. R. H. Martindale,  
That the report of the Treasurer be adopted. *Carried.*

Mr. P. B. Yates, Chairman, Convention Committee, presented a report from that Committee, recommending that the next Convention be held at the Clifton, Niagara Falls, on June 23, 24 and 25.

Moved by Mr. H. F. Shearer,  
Seconded by Mr. R. H. Martindale,  
That the report of the Convention Committee be adopted. *Carried.*

As a suggestion for 1922, Mr. Shearer outlined the facilities in Belleville for holding a Convention.

Mr. Yates then outlined plans for entertainment at the June Convention, details of which will be taken care of by the Convention Committee. These included entertainment at the Convention Dinner, and after dinner speakers. Entertainment during the evening after the dinner, a burlesque baseball match during the second afternoon, a dance on the second evening and a trip over the Chippawa-Queenston Development on the third day.

Due to the absence of Mr. H. H. Couzens, Mr. R. T. Jeffery presented the report of the Papers Committee. After discussing the suggestions, it was finally decided that the following be presented:

JUNE 23, P.M.

A series of 10 minute talks by various commercial members on the following subjects:

(a) Advertising. (b) Window Dressing. (c) Sales Campaigns. (d) Service in Merchandising.

JUNE 24, A.M.

"Power supply in Rural Communities," by J. W. Purcell, of the Hydro-Electric Power Commission of Ontario.

AFTERNOON.

"Safeguarding the users of Electrical Appliances," by an engineer of The Laboratory of The Hydro-Electric Power Commission of Ontario.

Moved by Mr. H. F. Shearer,

Seconded by Mr. R. H. Starr,

That the report of the Papers Committee as amended be adopted. *Carried.*

The discussion turned to the election of officers at the annual meeting.

Moved by Mr. R. H. Starr,  
Seconded by Mr. P. B. Yates,

That the by-laws be amended to provide for a primary ballot at the mid-summer Convention to enable the nominating committee to prepare a final ballot to be submitted to the Class "A" members for a letter ballot to be in the hands of the Secretary on or before January 1st of each year. That the committee previously appointed be required to draft amendments to be submitted at the June Convention. *Carried.*

The president named Messrs. J. G. Archibald, O. H. Scott, and the secretary, a committee to bring in amendments to the by-laws as provided in the resolutions.

The meeting adjourned at 5.00 p.m.



# HYDRO NEWS ITEMS

## Niagara System

GENERAL—On April 8th a circular letter was sent to all municipalities on the Niagara System advising that additional power is available and loads should be increased as much as possible. This was very welcome news after the years of restriction.

Estimates in connection with the cost of power have recently been forwarded to the Municipalities of Merlin, Thedford and Alvinston and it is expected power will be supplied to these municipalities during the present year.

CHATHAM—The electric steel smelting plant which has been undergoing installation by the Chatham Hydro-Electric System during the past year is now being started in operation. This plant will be operated along the lines originated by Mr. J. G. Jackson, Manager of the Chatham Hydro-Electric System, and will utilize off-peak power, principally at night. The furnace and regulators were supplied by the Volta Manufacturing Company, of Welland.

The Chatham Wallaceburg & Lake Erie Railway is now operated by Hydro Power supplied from the Chatham Public Utilities Commission. The rotary converters were installed by the company sometime ago but were not put into operation until recently owing to power shortage con-

ditions on the Niagara System. This company originally operated the road by means of steam generated power, using natural gas. When the gas supply for industrial purposes was cut off, the very high cost of power generated from coal made it difficult to make the road pay and the introduction of Hydro for the operation of this line is of great advantage to the district served.

GALT—The Galt Public Utilities Commission has recently obtained the approval of the Commission in connection with a combined new office and sub-station building. The new office building will be of modern construction, special attention being given to the design of showroom and office space. The sub-station equipment will be of the very latest type and ample provision will be made for future load increase.

HAGERSVILLE—The Hagersville Quarries, Limited, has signed a contract with the Municipality of Hagersville for 250 horsepower. This company is working the old Michigan Central quarry, which has up to the present time been operated by steam plant. The rock in the Hagersville district makes very high grade material for road construction purposes. Large quantities are shipped from this district for use as ballast by the Michigan Central Railway.

INGERSOLL—The Commission recently approved of an expenditure of \$6,500 by the Ingersoll Public Utilities Commission for the purchase of an office building on the main street. At the present time the local office is in an extension of the sub-station and this has become unsuitable both for the handling of appliances and also for the collection of customers' accounts.

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NIAGARA FALLS—Mr. John E. Teckoe commenced his duties on April 1st as manager of the Niagara Falls Hydro-Electric System. Niagara Falls was fortunate in securing a man of Mr. Teckoe's ability.

The Niagara Falls Hydro-Electric System proposes erecting a new sub-station during the coming summer at a cost of approximately \$100,000. The present equipment is located in what was originally an old steam plant and both the building and equipment have become unsuitable for the rapidly increasing load.

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PORT DOVER—As soon as weather conditions permit, work will be commenced in connection with the construction of the line to Port Dover. The Municipality of Port Dover has authorized the Commission to construct a distribution system for the municipality and this work will also be commenced at an early date.

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TILLSONBURG—Mr. S. Buckley has been appointed as Superintendent of the Tillsonburg Hydro-Electric System. Mr. Buckley is a resident of Tillsonburg and will commence his duties with a thorough knowledge of the system and customers.

### St. Lawrence System

GENERAL—Preparations for supplying power to the Cornwall Pulp & Paper Company at Cornwall, are practically complete, and the company is expected to be taking power in the very near future. The company was delayed in the construction of its sub-station, and was unable to secure delivery of some of the electrical apparatus required for the sub-station.

The Toronto Paper Company has not yet started its new plant, requiring additional power. We expect that the company will be requiring 1,000 additional horsepower shortly.

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ALEXANDRIA—Power has been supplied from Cornwall to this municipality for three months, and electrical matters are now being conducted by a newly formed Public Utilities Commission. New rates have been put into force and customers have already been billed on these new rates.

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APPLE HILL—This municipality will receive service in the near future out of the above sub-station.

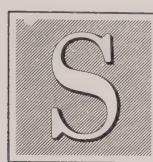
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MAXVILLE—This municipality has received service from the St. Lawrence System since the middle of February. Power is supplied to the town at 4,000 volts, from a station erected at Apple Hill. The municipality has a new system of rates and billing in effect.

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The increase in cultivation in Canada during 1914-1919 exceeded 9,600,000 acres.

## HYDRO BOWLING LEAGUE



OME five years ago a number of the Commission's employees in Toronto formed a club to engage in the popular indoor game of five-pins. The interest which has developed is shown by the keen competition to secure place on the teams; during the past season no less than twenty-four 5-men teams engaged in the regular schedule of matches.

The winning team proved to be the one entered from the Chippawa Division of the Electrical Engineering Department.

At the annual banquet of the league, which is to take place shortly, the prizes will be presented, plans for next season discussed and new officers elected.

The enjoyment and benefit that is derived from a competitive sport of this kind is remarkable. Members from all departments are enabled to become more closely acquainted with one another, increasing the good-will which already exists between the employees of the various departments.

The retiring Executive Committee is composed of the following:—

A. G. Lang, President; A. V. Trimble, Vice-President; J. P. Morgan, Secretary; B. O. Salter, Treasurer; and A. R. Rice.

The following is a list of the prize winners for the season 1920-21:—

### TEAM PRIZES

1. Electrical, Chippawa.
2. Follow-up.
3. Distribution.
4. Accounting.
5. Construction.

### HIGH INDIVIDUAL PRIZES

	SEASON'S AVERAGE
1. A. R. Rice .....	207.0
2. F. B. Shand .....	192.2
3. R. M. Thompson .....	188.6
4. A. N. Hunter .....	188.1
5. F. B. Chandler .....	186.7
6. J. P. Morgan .....	184.6
7. S. W. B. Black .....	184.5
8. G. O. Vogan .....	184.3
9. W. Turpin .....	184.2
10. N. Curzon .....	183.7

The prize for high three games for a team was taken by Hydraulic General with a score of 2,842. The Distribution Team made a record for this or any other Toronto league, by rolling 3,032 for three games but they qualify under the third team prize.

The individual prize for high three games was taken by Spencer of Accounting Team with a score of 755. G. O. Vogan of the Hydraulic-Nipigon Team was actually high but qualified in the first ten bowlers for the season.

In addition a prize was awarded to the high man on each of the twenty-four teams.

Canada possesses the largest pulp-wood resources of any country in the world.

The stems and leaves of the "burning tree" of India are covered with fine hairs, similar to those of the nettle, but of a more virulent nature. When touched the sensation felt is as of being burned with a hot iron, the pain lasting several days and extending over the entire body.

## ONTARIO HYDRO-ELECTRIC CLUB

At the Annual Banquet of the Bowling League last spring, discussion arose over the need of a central organization to handle all the varied activities of the staff from a social, athletic and educational standpoint. A committee was formed to investigate the possibilities of forming a club and report back. This was done and an organization committee was appointed to draw up a constitution and by-laws for the club. This committee also got data from the officials of employees' organizations at the Canadian Kodak Company, Robert Simpson Company, Wrigley Company and others. Notices were then sent out to each department asking them to appoint delegates to a general committee. At a meeting of this committee, the Ontario Hydro-Electric Club was formed, the constitution adopted and an executive elected to carry on the business of the club for one year.

The aim and purpose of the club as set forth in the constitution is to create a spirit of goodfellowship among the members of the staff and to do this by promoting and encouraging social functions, athletics and educational meetings.

To date the activities of the club may be briefly summarized as follows:

Three dances have been held. These have each proved to be a success both from the standpoint of enjoyment and finances.

The Commission granted a sum of money for the construction of a skating rink but unfortunately the ex-

ceptionally mild winter prevented the fullest use of the facilities provided.

A Chess Club has been formed and the O. H. E. Cub has been admitted to a Chess League and has won several contests.

A Musical Club has been formed which gives promise of being very successful and practices are now being held each week.

A Tennis Club has been formed and a request made to the Commission for permission to use the space occupied by the rink for tennis courts.

A Soccer Club has also been entered in a League and plays every Saturday afternoon at various city parks.

The club is also arranging for a "Hydro Day and Picnic" to Niagara Falls and Queenston on July 14th. Details have not been worked out for this however but will be announced later.

Membership tickets have been issued and one gratifying feature of the recent membership campaign was the whole-hearted support given by the staff. Out of approximately 650 possible members, over 600 have joined the club. Plans are now under way for a suitable club house where meetings can be held and reading and recreation rooms provided for the use of the staff after hours.

The Executive for the year 1921 is as follows: J. P. Morgan, president; G. D. Floyd, vice-president; J. C. Wills, secretary, Miss R. Macquarie, Miss B. Brent, G. O. Vogan, W. C. Cale, C. D. Lennox, S. Eisenhofer, Committee.

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What is wisdom but having a great deal to say and keeping silent?

## ONTARIO HYDRO-ELECTRIC CLUB DANCE

The Ontario Hydro-Electric Club held its final dance of the season on Friday, April 15th, and it was a great success. About four hundred guests were present and thoroughly enjoyed the splendid music supplied by the Pavlowa Orchestra.

Mr. Vickery, a tenor soloist, introduced some of the latest song novelties which made a decided hit. A dainty luncheon was served in the balcony at individual tables and extras were played during the supper intermission.

A novelty dance was the lucky number balloon dance. Two hundred colored balloons with numbered tags attached were tossed down from the balcony and the four ladies who held the lucky numbers were each presented with a box of chocolates.

The patronesses for the occasion were Mrs. F. A. Gaby, Mrs. W. W. Pope, Mrs. M. V. Sauer, Mrs. E. T. Brandon, Mrs. T. U. Fairlie, and Mrs. E. F. Latimer.

Several out of town visitors who are connected with the Hydro were present as well as representatives of the electrical industries in Toronto.

The committee in charge of the dance was as follows: Mr. J. P. Morgan, chairman, Miss F. Macquire, Miss M. Kennedy, Miss E. Anderson, Mr. G. O. Floyd, Mr. M. C. Hare, Mr. B. N. Simpson and Mr. G. O. Vogan.

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Internal combustion engines have been built in Denmark that are claimed to work well with peat gas as fuel.

## Canals for Garden of Eden.

The Garden of Eden is to be irrigated and made fit for human habitation. At least so say the French and British Governments. The Garden was a prize of the late war which they won, conjointly; and which, conjointly, they must now retrieve from the evil days into which it fell under the rule of the Turk. Eden, as understood in this proposal, consists of millions of fertile acres fifty miles west of Bagdad along the Euphrates River. When Herodotus, who was born in 384 B. C., visited Mesopotamia, he said he found it "a forest of verdure from end to end." The Babylonians, whose country it was, were famed for their canals; their system of irrigation has amazed engineers through all the ages since and is still a matter of wonder to twentieth century scientists.

An intricate system of canals that watered all Babylonia spreads its ruins in the sands for miles about Bagdad. One giant waterway, the Narawan, ran parallel with the Tigris for 300 miles. The date of the building of Narawan was probably about 2500 or 4000 B. C. There were older canals in this area, however, along the ruined sites of which the Anglo-French canal building will be carried on. According to archaeologists the Garden of Eden was situated in this territory, but where is a matter of conjecture.—*New York Times*.

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The Chinese make pineapple cloth from the leaf fibres of the plant, extracted by hand labor, obtaining about a pound of fibre from each 100 pounds of leaves.

Association of Municipal Electrical  
Utilities of Ontario

CONVENTION

AT

The Clifton Hotel  
Niagara Falls, Ontario

June 23, 24 and 25, 1921

The Queenston-Chippawa Power Development is approaching completion. See the works before the water is turned on.

# HYDRO MUNICIPALITIES

## NIAGARA SYSTEM

	Pop.		Pop.	Pop.	
Acton	1,563	Rodney	686	Durham	1,520
Ailsa Craig	486	Sandwich	3,643	Elmwood	350
Ancaster	400	Sarnia	12,649	Flesherton	410
Ancaster Twp.	4,058	Scarborough Twp.	7,843	Grand Valley	582
Aylmer	2,247	Seaford	2,015	Hanover	2,724
Ayr	802	Simcoe	3,756	Holstein	285
Baden	710	Springfield	420	Horning's Mills	350
Barton Twp.	6,382	St. Catharines	19,195	Kilsyth	
Beachville	503	St. George	600	Kincardine	1,992
Biddulph Twp.	1,623	St. Jacobs	400	Lucknow	902
Blenheim	1,490	St. Mary's	3,886	Markdale	869
Bolton	587	St. Thomas	17,759	Mount Forest	1,838
Bothwell	680	Stamford Twp.	4,000	Neustadt	430
Brampton	4,270	Stratford	18,106	Orangeville	2,186
Brantford	32,159	Stratroy	2,637	Owen Sound	12,218
Brantford Twp.	6,741	Streetsville	525	Priceville	
Breslau	500	Tavistock	876	Ripley	
Brigden	400	Thamesford	388	Selborne	1,063
Burford	700	Thamesville	804	Tara	520
Burford Twp.	3,788	Thordale	250	Teeswater	852
Burgessville	300	Tilbury	1,619	Wingham	2,240
Caledonia	1,265	Tillsonburg	2,856		
Chatham	15,182	Toronto	499,278	Total	39,571
Chippawa	1,172	Toronto Twp.	5,234	<b>OTTAWA SYSTEM</b>	
Clinton	1,809	Townsend Twp.	2,988	Ottawa	107,732
Comber	800	Vaughan Twp.	4,184	<b>THUNDER BAY SYSTEM</b>	
Copetown	230	Walkerville	6,279	Port Arthur	15,094
Dashwood	350	Wallaceburg	4,067	<b>CENTRAL ONTARIO SYSTEM</b>	
Delaware	350	Waterdown	791	Belleville	12,240
Dereham Twp.	3,200	Waterford	1,084	Bloomfield	600
Dorchester	400	Waterloo	5,476	Bowmanville	3,259
Dorchester S. Twp.	1,376	Watford	6,475	Brighton	1,376
Drayton	600	Welland	1,033	Camden East Twp.	3,050
Dresden	1,411	West Lorne	9,135	Cobourg	4,874
Drumbo	375	Wellesley	787	Colborne	869
Dublin	218	Weston	2,570	Darlington Twp.	3,407
Dundas	5,009	Windsor	31,629	Deloro	259
Dunville	3,517	Woodbridge	587	Deseronto	2,017
Dutton	860	Woodstock	10,126	Havelock	1,220
Elmira	2,392	Wyoming	503	Kingston	23,261
Elora	1,205	York Twp.	44,232	Lakefield	1,133
Embro	437	Zurich	457	Lindsay	7,841
Etobicoke Twp.	7,281			Madoc	1,056
Exeter	1,445			Marmora	856
Fergus	1,710			Millbrook	740
Flamboro E. Twp.	2,499			Napanee	2,863
Forest	1,422			Newcastle	553
Galt	12,434			Newburgh	434
Georgetown	2,121			Norwood	698
Glencoe	824			Omemeo	517
Goderich	1,649			Orono	700
Grantham Twp.	3,456			Oshawa	10,126
Granton	300			Peterborough	21,230
Guelph	17,032			Pickering Twp.	4,382
Hagersville	1,072			Picot	3,165
Hamilton	114,766			Port Hope	4,394
Harriston	1,340			Richmond Twp.	1,944
Hensall	721			Seymour Twp.	2,506
Hespeler	3,000			Stirling	849
Highgate	371			Trenton	5,736
Ingersoll	5,385			Tweed	1,288
Kitchener	21,056			Wellington	853
Lambeth	350			Whitby	3,102
Listowel	2,551			Whitby Twp.	1,734
London	59,100			Whitby E. Twp.	3,420
London Twp.	6,073				
Louth Twp.	2,312			Total	134,552
Lucan	620			<b>ST. LAWRENCE SYSTEM</b>	
Lynden	622			Alexandria	2,200
Markham	836			Apple Hill	
Merriton	2,553			Brockville	9,326
Milton	1,800			Chesterville	949
Milverton	1,044			Lancaster	593
Mimico	2,887			Martintown	
Mitchell	1,656			Maxville	753
Moorefield	335			Prescott	2,774
Mount Brydges	500			Williamsburg	200
New Hamburg	1,370			Winchester	1,019
New Toronto	2,696			Winchester Springs	
Niagara Falls	14,207				
Niagara-on-the-Lake	1,918			Total	17,814
Norwich	1,271			<b>RIDEAU SYSTEM</b>	
Norwich N. Twp.	1,879			Carleton Place	3,786
Norwich S. Twp.	1,888			Kemptville	1,179
Oil Springs	473			Lanark	583
Otterville	400			Perth	4,047
Palmerston	1,890			Smith's Falls	6,665
Paris	4,320				
Parkhill	1,213			<b>ESSEX COUNTY SYSTEM</b>	
Petrolia	2,863			Amherstburg	2,170
Plattsburgh	500			Canard River	50
Point Edward	1,037			Cottam	333
Port Colborne	3,235			Essex	1,753
Port Credit	878			Harrow	619
Port Dalhousie	1,447			Kingsville	1,732
Port Stanley	717			Leamington	4,360
Preston	5,184			Total	11,017
Princeton	600			<b>THOROLD SYSTEM</b>	
Ridgeway	2,150			Thorold	5,012
Rockwood	520				

**T**HE aim of The Bulletin is to provide municipalities with a source of information regarding the activities of the Commission; to provide a medium through which matters of common interest may be discussed, and to promote a spirit of co-operation between Hydro Municipalities.